REMARKS

This application was originally filed with Claims 1-65. Previously, Claims 33-50 and 58-65 were cancelled. Claims 1-32 and 51-57 are pending. In this response, the rejections are traversed.

Rejections under 35 U.S.C. § 102

Claims 1-2, 5, 7-8, 17, 19, 28-29, and 51-57 stand rejected under 35 U.S.C. § 102(a) as being anticipated by Sammes (WO 99/17390).

Applicant respectfully traverses this rejection, at least, for the following reasons.

Sammes Lacking Elements of Claim 1 Cannot Anticipate

Claim 1, from which all other claims depend *requires,* in part, an anode-side current collector "wherein the anode-side current collector comprises a preformed *tubular* metallic structure which is adapted to permit fuel gas in the passage to contact the anode layer . . . such that the tubular metallic structure is at least partly embedded in the anode layer and reinforces the anode layer."

Sammes does not disclose an anode-side current collector that comprises a preformed *tubular* structure. Sammes describes the formation of a tubular fuel cell, wherein:

> The anode is porous, because it has to be permeable to gases, it can be made of nickel, mixed with the electrolyte. . . .
>
> The electrolyte tube is made by making a paste of the electrolyte material with binders and plasticisers. The paste is extruded into tube (*sic*), and then sintered.
>
> Anode and cathode material containing slurries are made and are put on the inside and outside of the electrolyte, respectively. The anode slurry is applied by suction, the cathode is pasted or sprayed on. Then the electrodes are sintered. Sammes, Pg. 11, lines 14-23.

Sammes further provides: "[A]n alternative way of producing cells is by first extruding and sintering a tube of anode material. Onto this tube a thin layer of electrolyte is applied, the contact area of which, with the anode, can be increased by applying suction to the anode tube. This is sintered and subsequently the cathode is applied and sintered. Pg. 12, lines 1-4.

Thus, it is clear that Sammes discloses forming and sintering the anode/electrolyte/cathode assembly and sintering the same before applying any current collection means.

Therefore, Sammes cannot anticipate the instant invention because Sammes describes the formation of a fuel cell which has the current collection mean applied after the fabrication of the fuel cell. Therefore, the anode-side current collector cannot be embedded in the anode layer as is required by the claims.

Sammes Is Mischaracterized By The Office

The Office states, "[W]ith regard to Claims 17 and 19, Sammes discloses wherein the anode layer material is extruded onto the tubular metallic structure of the anode-side current collector and sintered and the electrolyte layer is provided in the anode layer by the method of slurry coating and extrusion onto the anode layer and co-extrusion with the material of the anode layer (page 11, lines 19-23)." Office action at Pg. 3, last paragraph. This is incorrect. As quoted above, the section cited by the Office states:

> The electrolyte tube is made by making a paste of the electrolyte material with binders and plasticisers. The paste is extruded into tube (*sic*), and then sintered.
>
> Anode and cathode material containing slurries are made and are put on the inside and outside of the electrolyte, respectively. The anode slurry is applied by suction, the cathode is pasted or sprayed on. Then the electrodes are sintered. Sammes, Pg. 11, lines 19-23.

Thus, contrary to the Offices' assertion, there is absolutely no mention in the passage cited by the Office of: (i) an anode-side current collector; (ii) a tubular metallic structure; and (iii) extruding the anode layer onto the tubular metallic structure. The passage, in fact, explicitly states that the "anode and cathode material containing slurries are made and are put on the inside and outside of the electrolyte, respectively. Thus, it is clear the Office has mis-characterized Sammes because Sammes does not describe extruding an anode layer on a tubular metallic structure as is required by the claims. For this reason alone, the rejection is overcome and should be withdrawn..

Further, according to the Office, Sammes describes the anode-side current collector at page 12, lines 20-21. "The electrons produced at the anode are passed to a current collector, for

instance, made of nickel, consisting of a number of **wires** twisted around each other." First, Applicants point out that the portion of Sammes the Office chose to identify is not in the section labeled "The tubular cells" but rather in the section labeled "Current pick-up." The passage cited comes immediately after the paragraph which states:

> The connector 14 is made of sheet metal with a thickness of 0.2-0.3 mm, cut into a rectangle of about 8 by 8 mm, with a lip of 3 by 8 mm, approximately. It is folded around a rod, with the same diameter as the tubular cell, and mounted on the ceramic tube. A small hole in the lip provides the connection with the anode **wire** of an adjacent cell. The end of the lip is preferred to be at a level with the end of the cell, thus short circuiting is prevented.
>
> The electrons produced at the anode are passed to a current collector, for instance made of nickel, consisting of a number of **wires** twisted around each other. By twisting **wires**, electrical contact is ensured, but also space for gas to pass remains." Pg. 12, lines 14-23 (emphasis added).

Thus, the passage chosen by the Office to identify the anode-side current collector is not the anode-side current collector but the *in series* current collector for all the anodes. This interpretation is further explicitly identified by Sammes.

> The positive and negative leads of the connected cells, are connected to the outside world by an electrically insulating and gas tight feed through block. The component essentially consists of a lengthways bored through steel rod 27 of a few centimeters long. Gas is supplied through a bore at the side of the rod, and the **wires** 18,19 are passed straight through. The **wires** pass through holes in a PTFE (or similar ring 20, at the bottom of the rod , and then bend sideways. Sammes, Pg. 14, lines 29 to pg. 15, line 15 (emphasis added).

This arrangement is illustrated by Sammes in Figs. 3 (mislabeled as 25, lower portion) and Fig. 1.

As described by Sammes:

> At a temperature of typically 600-1000°C, the gases are converted, thereby producing electricity. . . . The electricity is passed to one end of the cells through electrically conducting wires or inks **on** the electrodes. Typically, cells will be connected electrically in series at the bottom (the fuel side) of the base plate." Sammes, Pg. 15,

lines 23-25 (emphasis added). (Applicants points out that the only other mention of "wire" is support wire 30 at Pg. 13, line 25).

Thus, whatever the exact arrangement of the anode-side collector, it is clear that they are not embedded in the anode material because Sammes explicitly says 'on' rather than using the words in, within or embedded. Therefore, because Sammes does not disclose an anode-side collector that is "a preformed tubular metallic structure" that is "at least partially embedded in the anode layer" as is required by Claim 1, the rejection is overcome and should be withdrawn.

The Device Of Sammes As Construed By The Office Does Not Yield The Present Invention

In the Office Action, the Office determines that the wires, being twisted, constitute the "preformed tubular metallic structure" required by Claim 1. Office Action at Pg. 3. However, if the Office's interpretation of Sammes is correct, *twisted* **wires** do not constitute a *tubular structure as required by the Claims*. Specifically, applicants note that the definition of 'twist' is:

> **1a.** To wind together (two or more threads, for example) so as to produce a single strand. **b.** To form in this manner: *twist a length of rope from strands of hemp.* **2.** To wind or coil (vines or rope, for example) about something. **3.** To interlock or interlace: *twist flowers in one's hair.* The American Heritage® Dictionary of the English Language: Fourth Edition. 2000.

In contrast, 'tubular' is defined as:

1. Of or relating to a tube. **2.** Constituting or consisting of tubes or a tube. **3.** Shaped like a tube.

'Tube' being defined as:

1a. A hollow cylinder, especially one that conveys a fluid or functions as a passage. **b.** An organic structure having the shape or function of a tube; a duct: *a bronchial tube.*

The American Heritage® Dictionary of the English Language: Fourth Edition. 2000.

Therefore, **wires**, twisted together, cannot constitute a "preformed tubular metallic structure." Thus, Sammes cannot anticipate the instant invention. For this reason, the rejection is overcome and should be withdrawn.

Further, applicants note that the definition of 'embed':

1. To fix firmly in a surrounding mass: *embed a post in concrete; fossils embedded in shale*. **2.** To enclose snugly or firmly. **3.** To cause to be an integral part of a surrounding whole

The American Heritage® Dictionary of the English Language: Fourth Edition. 2000.

Thus, as discussed above, Sammes describes how the electrodes are made. Briefly,

"Anode and cathode material containing slurries are made and are put on the inside and outside of the electrolyte, respectively. The anode slurry is applied by suction, the cathode is pasted or sprayed on. Then the electrodes are sintered." Sammes, Pg. 11, lines 21-23.

Thus, if the Office insists on regarding the 'wires' as the anode-side current collector, they cannot be inserted in the anode slurry before sintering because Sammes says anode and cathode material is applied to the electrolyte as slurries and sintered. If the wires are correctly identified as the anode-side collector, then they are applied after fuel cell fabrication. Therefore, the rejection is overcome and should be withdrawn.

Claim 1 further requires that the "tubular metallic structure is at least partly embedded in the anode layer and reinforces the anode layer." As characterized by the Office, the twisted wires are inserted into the tubular structure after the slurry is poured and sintered. Therefore, if the Sammes device is constructed as described by the Office, the anode-side current collector *cannot be embedded* in the anode *as is required by the Claims*. Therefore, for this reason, the rejection is overcome and should be withdrawn.

Further, if the 'wires' are not embedded in the anode, then they cannot provide structural reinforcement for the structure – *as is required by the Claims*. Therefore, the rejection is overcome.

<u>The Offices' Construction Does Not Result In A Tubular Fuel Cell</u>

Further, while the Office states that the phrase "formed on" is functional language, structure is given to the form on which the anode is fabricated. In other words, were the Office correct, and the anode-side current collector was a twist of nickel wires, then the forming of the anode on the twist by a slurry would not result in a tubular fuel cell – as is required by the

Claims. Therefore, the rejection over Sammes is overcome and should be withdrawn. Applicants respectfully request same.

The Device Of Sammes As Construed By The Office Would Not Work

As discussed above, the office has identified the *tubular* anode-side current collector as the *twisted* wire of Sammes. As required by the claims, the anode layer is formed on the tubular structure. As described by Sammes (and the instant invention), the anode is formed by a slurry. Claim 1, requires that the slurry is formed on the anode-side current collector (twisted wires as construed by the Office) and sintered so as to be embedded and form a support. First, Applicants point out that the result would not be tubular, would have no hollow interior and would have walls of varying and undulating thickness. Applicants, therefore, submit that any fuel cells made thusly would have extremely poor conduction characteristics and would be unusable. For this reason, the rejection over Sammes is overcome and should be withdrawn.

The rejection of Claims 1-2, 5, 7-8, 17, 19, 28-29 and 51-57 over Sammes being unworkable, the rejection is overcome and should be withdrawn. Applicants respectfully request same.

Rejections under 35 U.S.C. § 103

Rejection over Sammes in view of Dodge

Claims 3 and 4 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Sammes (WO 99/17390), as applied to Claims 1-2, 5, 7-8, 17, 19, 28-29 and 51-57 in further view of Dodge (WO 96/04690).

This rejection is overcome, at least, for the following reasons

Dodge Does Not Remedy The Defects Of Sammes

Claims 3 and 4, depending from Claim 1, require an anode-side current collector that comprises a preformed tubular metallic structure. Dodge does not disclose an anode-side collector that is a preformed tubular structure. Further, the Office asserts that one of skill in the art would combine Sammes with Dodge because Dodge teaches the use of grooves or outward projections on the anode layer of the tubular fuels cell assembly to aid in facilitating dispersal of hydrogen containing gas to the anode. The Office has taken Dodge out of context.

Dodge Teaches Against The Combination

Dodge states:

> The first hollow member 910 receives a hydrogen containing gas and has a construction effective for passing the hydrogen containing gas from the interior space to the peripheral surface. The first hollow member 910 may comprise a porous tube, in which case the hydrogen containing gas passes through the pores in the porous tube from the interior space to the peripheral surface.
>
> Alternatively, as shown in Figures 3(a), 3(b), the first hollow member 910 may comprise a hollow tube having through-holes 912 for passing the hydrogen containing gas from the interior space to the peripherals surfaces.

Thus, Dodge describes two embodiments. Dodge teaches that when, as in the first embodiment, the tube is porous, "through-holes" are not necessary. However, in a second embodiment, when the tube is not porous, "through-holes" are used. Therefore, Dodge teaches against the instant invention because the instant invention provides a porous tube and therefore, according to Dodge, through-holes are not used. Therefore, for this reason alone, the rejection of Claims 3 and 4 over Sammes in view of Dodge is overcome and should be withdrawn.

Rejection over Sammes in view of Isenberg

Claims 6, 9-10, 18 and 20-27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sammes (WO99/17390) as applied to Claims 1-2, 5, 7-8, 17, 19, 28-29 and 51-57 in further view of Isenberg (EP0055016A1).

This rejection is traversed, at least, for the following reasons.

Isenberg Does Not Remedy The Defects Of Sammes

First, Applicant points out that Claims 6, 9-10, 18 and 20-27 depend from Claim 1. As neither Sammes, Dodge nor Isenberg disclose a *tubular* metallic anode-side collector, as is required by Claim 1, they can not further make obvious Claims 6, 9-10, 18 and 20-27.

Isenberg Teaches Against

Isenberg discloses a tubular fuel cell having an inner anode. However, there is no suggestion of any current collector inner support tube. Lacking an inner support tube, Isenberg cannot further disclose one that is at least partly embedded in the anode layer and reinforces the

anode layer as is required by the claims. Instead, the third paragraph on page 6 describes a porous non-conductive support tube 26 which provides structural integrity to the cell. Isenberg goes further as to specify potential materials for its construction, specifically, calcia stabilized zirconia. Thus, not only does Isenberg not supply the missing elements of Claim 1, it teaches against the use of a conductive support comprising the anode-side collector. In addition, Isenberg fails to disclose the elements required of Claims 6, 9-10, 18, and 20-27. Therefore, the rejection is overcome and should be withdrawn.

Rejection over Sammes in view of Will

Claims 9-16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sammes (WO99/17390) as applied to Claims 1-2, 5, 7-8, 17, 19, 28-29 and 51-57 in further view of Will (US 4,347,429).

This Rejection Is Traversed For, At Least, The Following Reasons.

Will Does Not Remedy The Defects Of Sammes

Claims 9-16 depend from Claim 1 and therefore require an anode-side current collector comprising a preformed tubular metallic structure. As discussed above, Sammes does not disclose or teach an anode-side current collector comprising a preformed *tubular* metallic structure. Further, applicants point out that the claim requires a *tubular* structure. The device described by Will comprises "A porous conductive substrate comprising a metal screen or perforated foil or porous sintered body . . ." Applicants refer the Office to the definition of tubular (above). The screen or foil disclosed by Will is not tubular. For this reason alone, Will cannot make obvious claims that *require* a tubular structure. The rejection of Claims 9-16 over Sammes in view of Will, being thus overcome, withdrawal is earnestly solicited.

There Is No Motivation To Combine

Further, besides the fact that neither Sammes nor Will teach, disclose or discuss a fuel cell assembly wherein the anode-side collector is tubular, there is no motivation to combine Sammes with Will. Sammes provides its own support structure. Specifically, the Applicant refers the Office to Sammes:

> The system is made more resilient to external mechanical impact by placing a perforated plate with holes 24, coinciding with the holes of the base plate, at the end of

> the cells. This plates is held in position by a rod 26, that is screwed in the base plate. to prevent short circuiting the holes are provided with an alumina tube 25, cemented onto the burner plate 1. Small slots in the inside of the alumina tubes allow air to pass. Thus, the tubular cells are free to expand in the axial direction, but are limited in movement in the radial direction, preventing breakage resulting from mechanical impact. Pg. 14, lines 7-14.

Therefore, as taught by Sammes, there is no reason or motivation to make the combination made by the Office. Thus, not only does Sammes not teach an anode-side current collector that is a preformed *tubular* metallic structure, Sammes provides its own means of support. The rejection of Claims 9-14 being thus overcome, withdrawal of the rejection is earnestly requested.

The Office Misrepresents Will

As to Claims 15-16, the claims require a "thermally conductive tube liner." The Office refers to Will at col. 2, lines 43-47 as disclosing "a thermally conductive tube liner is provided in the passage which defines a space to which the electrolyte is heated by conventional means." In fact, Will at col. 2, lines 43-47 states: "Inner electrode 10 and outer electrode 11 are disposed with major surfaces 12 and 13, respectively, in juxtaposition and spaced from each other to define therebetween a space 14 to which an electrolyte to be heated is provided by conventional means 53." Therefore, Applicants question where the elements are recited to which the Office refers. Applicants submit that, in fact, Will does not disclose a "thermally conductive tube liner" but describes a space 14 between major surfaces 12 and 13. The rejection of Claims 15-16 is thus overcome. Withdrawal is respectfully requested.

Rejection Over Sammes In View Of Goodenough

Claims 30-32 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sammes (WO 99/17390), as applied to Claims 1-2, 5, 7-8, 17, 19, 28-29 and 51-57, further in view of Goodenough (US 6,004,688).

This rejection is overcome, for at least the following reasons.

Goodenaugh Does Not Remedy The Defects Of Sammes

First, applicants point out that Claims 30-32 depend from Claim 1 and, therefore, like all the other pending claims, require an anode-side collector that comprises a "preformed tubular metallic structure." As discussed above, Sammes does not disclose or provide a tubular metallic structure. Further, Goodenough does not remedy the defects of Sammes. Specifically, Goodenough does not even teach a tubular fuel cell but a planar one. Further, there is no motivation to combine Goodenough with Sammes because Sammes does not teach any necessity for a side current collector other than its conductivity. Specifically, "[T]he electrically conducting layer (not shown) is, for instance, a silver wire or silver paste. Of course, any conductor with sufficient conductivity can be employed." Pg. 12, lines 12-13. Thus, one of skill in the art would not combine Goodenough with Sammes, because Sammes discusses no necessity or benefits derived from a mesh conductor nor does Goodenough describe any particular benefits to be derived from mesh. Further, Goodenough provides a planar fuel cell which therefore provides no motivation for its combination with the tubular fuel cell of Sammes.

Thus, neither Sammes nor any of the other references cited by the Office describe all the elements required by the independent claim, specifically, a preformed tubular metallic anode-side collector that is embedded in the anode and provides support thereto. Therefore, the claims cannot be obvious over Sammes combined with any of the other references cited and the rejection of Claims 1-32 and 51-57 is overcome and should be withdrawn. Applicants respectfully request same.

CONCLUSION

This response is being submitted on or before January 26, 2008 making this a timely response. It is believed that no additional fees are due in connection with this filing. However, the commissioner is authorized to charge any additional fees, including extension fees or other relief which may be required, or credit any overpayment and notify us of same, to Deposit Account No. 04-1420.

Based on the foregoing, Applicant submits that Claims 1-32 and 51-57 are in condition for allowance. An early indication of the same is therefore respectfully requested. If any matters can be resolved by telephone, the Examiner is invited to call the undersigned attorney at the telephone number listed below. No fees beyond those being submitted concurrently herewith are believed due.

Date: January 28, 2008

Respectfully submitted,

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